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## (12) United States Patent

Moriyama et al.

# (54) LIGHT EMITTING MODULE HAVING HEAT CONDUCTIVE SUBSTRATE

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This patent is subject to a terminal disclaimer.

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#### (57) ABSTRACT

A lighting apparatus including a plurality of light-emitting elements mounted on a first surface of a substrate, a heat conducting layer disposed on a second surface of the substrate opposite the first surface, and one or more holes extending from the first surface to the second surface of the substrate. A heat conductive and electrically non-conducting material covers an inner surface of the one or more holes, and is thermally connected to the heat conductive layer.

#### 2 Claims, 7 Drawing Sheets

